

Model-Based Off-Nominal State Isolation and Detection System for Autonomous Fault Management, Phase I

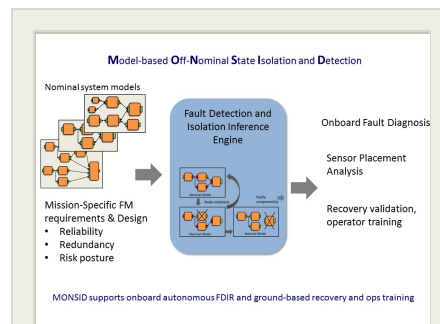
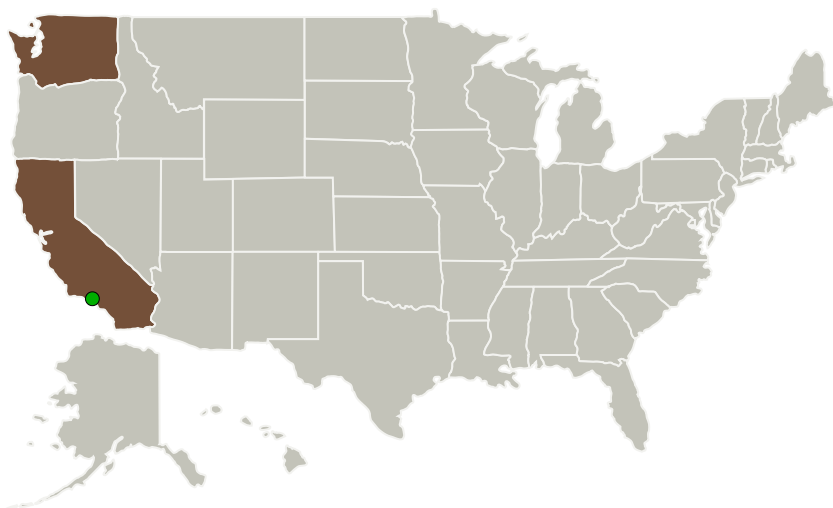
Completed Technology Project (2015 - 2015)



Project Introduction

The proposed model-based Fault Management system addresses the need for cost-effective solutions that enable higher levels of onboard spacecraft autonomy to reliably maintain operational capabilities. The system will provide onboard off-nominal state detection and isolation capabilities that are key components to assessing spacecraft state awareness. The ability to autonomously isolate spacecraft failures to component levels will enable faster recovery thereby reducing down time. Model-based systems can provide better fault coverage than traditional limit-checking systems. The proposed system in particular will result in a relatively compact software package because it relies only on modeling nominal behavior; fault models are not needed. Thus this approach has the capability to detect any off-nominal behavior including un-modeled faults. Health information produced by the FM system can be used to make resource allocation and planning and scheduling decisions by ground operations or by other on-board autonomy agents. The system can be built and tested standalone potentially reducing FM developmental and testing costs. The FM system provides an evolutionary approach to full onboard autonomy as it can first be implemented and tested in ground-based systems and then migrated onboard spacecraft. Onboard fault management will be crucial to NASA mission success particularly during critical times where the situation changes rapidly and unpredictably with no opportunity for operator support.

Primary U.S. Work Locations and Key Partners



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Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Project Transitions	2
Images	2
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	2
Technology Areas	3
Target Destinations	3

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Completed Technology Project (2015 - 2015)



Organizations Performing Work	Role	Type	Location
Okean Solutions	Lead Organization	Industry	
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations	
California	Washington

Project Transitions

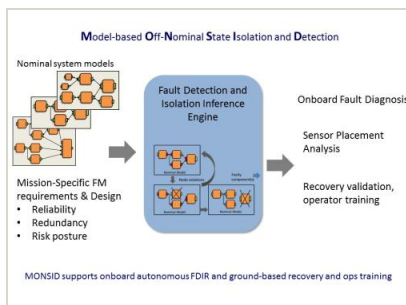
**June 2015:** Project Start**December 2015:** Closed out

Closeout Summary: Model-Based Off-Nominal State Isolation and Detection System for Autonomous Fault Management, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/139120>)

Images



Briefing Chart Image

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(<https://techport.nasa.gov/image/126160>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Okean Solutions

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

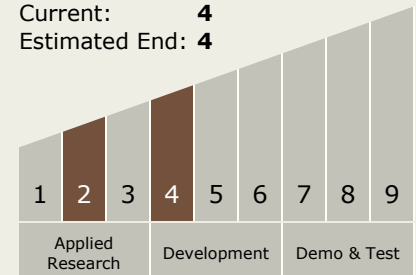
Carlos Torrez

Principal Investigator:

Ksenia Kolcio

Technology Maturity (TRL)

Start: 2
Current: 4
Estimated End: 4



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Technology Areas

Primary:

- TX10 Autonomous Systems
 - └ TX10.2 Reasoning and Acting
 - └ TX10.2.3 Motion Planning

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System